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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: KENJI HORII ET AL.

Serial No.: Not Yet Assigned Group Art Unit:

Filed: December 14, 2000 Examiner:

Title: METHOD OF BONDING METAL PLATES, APPARATUS THEREFORE AND HOT STRIP MILL

PRELIMINARY AMENDMENT

Box APPLICATION
Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination and before calculation of fees, please preliminarily amend the above-identified application filed herewith as follows:

IN THE SPECIFICATION:

Page 1, line 5, insert the following paragraph:

-- This application claims the priority of Japanese Patent Application No. 11-345215, filed in Japan December 14, 1999, and Japanese Patent Application No. 2000-316522, filed in Japan October 17, 2000, the disclosures of which are expressly incorporated by reference herein.

ABSTRACT OF THE DISCLOSURE:

Please substitute the following new Abstract of the Disclosure for the one attached as page 51 of the specification.

IN THE CLAIMS:

Please amend the claims as follows:

7. (Amended) A method of bonding metal plates according to [any one of Claims 3 to 6] Claim 3; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

9. (Amended) A method of bonding metal plates according to Claim 8, wherein a shearing blade equipped with the protrusion is applied onto opposed positions of both sides of the metal plates[, and a method of bonding metal plates according to any one of Claims 3 to 7 is employed].

10. (Amended) A method of bonding metal plates according to [any one of Claims 3 to 9] Claim 8; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

13. (Amended) An apparatus for bonding metal plates according to Claim 11 [or 12];

wherein there is provided a protrusion, which bites into the metal plate during the shearing process, on at least either one of the shearing blades, at a portion to be in contact with the metal plates.

16. (Amended) An apparatus for bonding metal plates according to [any one of Claims 11 to 15] Claim 11; wherein there is provided a clamp which applies a pressure so as to sandwich the overlapped portion.

17. (Amended) A hot strip mill including a bonding apparatus for bonding a preceding bar and a following bar in motion between a coarse rolling mill and a finish rolling mill for rolling hot rolled strips;

wherein said bonding apparatus [comprising] comprises an overlapping mechanism which overlaps the portions to be bonded of the preceding bar and the following bar each other; a bonding mechanism equipped with upper and lower shearing blades which, while pressing and shearing the bars from above and from below, bond the two overlapped bars; and a shearing blade drive mechanism which applies a pressing force onto the shearing blades.

19. (Amended) A hot strip mill according to Claim 17 [or 18]; wherein the shearing blade drive mechanism is so constructed as to perform a cyclic operation by causing the upper and lower shearing blades to stand by at a specified stand-by position, starting pressing the shearing blades when the overlapped portion of the two bars has reached the bonding mechanism, and then returning the shearing blade back to the stand-by position when the shearing blades have completed a pressing stroke up to the completion of bonding; and a synchronous operation by moving the shearing blades so as to follow the bar movement while the shearing blades are in contact with the bars.

20. (Amended) A hot strip mill according to Claim 17[, 18, or 19]; wherein the overlapping mechanism is so constructed as to increase the following bar speed and overlap the two bars when the trailing end of the preceding bar has reached a specified position, and return the bar speed to an original one when the overlapped portion has reached a specified length.

Please add the following new claims:

24. (New) A method of bonding metal plates according to Claim 4; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

25. (New) A method of bonding metal plates according to Claim 5; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

26. (New) A method of bonding metal plates according to Claim 6; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

27. (New) A method of bonding metal plates according to Claim 9; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

28. (New) A method of bonding metal plates according to Claim 3; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

29. (New) A method of bonding metal plates according to Claim 4; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

30. (New) A method of bonding metal plates according to Claim 5; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

31. (New) A method of bonding metal plates according to Claim 6; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

32. (New) A method of bonding metal plates according to Claim 7; wherein a clamping force is applied, corresponding to the pressing force generated, so as to sandwich the overlapped portion.

33. (New) A method of bonding metal plates according to Claim 9; wherein an operating locus of each of the shearing blade edges is so set that a pressing force pressing the sheared surfaces onto each other is generated.

34. (New) A method of bonding metal plates according to Claim 33; wherein the operating locus is so set that an extension line of each locus overlaps the inner side of the opposed shearing blade or crosses each other.

35. (New) A method of bonding metal plates according to Claim 34; wherein at least either one of the operating loci is so set as to be inclined with respect to the thickness direction of the metal plates.

36. (New) A method of bonding metal plates according to Claim 35; wherein, provided that an extension line of the operating locus overlaps the shearing blade, the overlap is 0.1 mm to 15 mm if the metal plates are on at least either one of the shearing blades, at a portion to be in contact with the metal plates.

37. (New) A method of bonding metal plates according to Claim 9; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

38. (New) A method of bonding metal plates according to Claim 36; wherein the stroke of the shearing blade is 50% to 150% of the thickness of the metal plate.

39. (New) An apparatus for bonding metal plates according to Claim 12; wherein there is provided a protrusion, which bites into the metal plate during the shearing process, on at least

either one of the shearing blades, at a portion to be in contact with the metal plates.

40. (New) An apparatus for bonding metal plates according to Claim 12; wherein there is provided a clamp which applies a pressure so as to sandwich the overlapped portion.

41. (New) An apparatus for bonding metal plates according to Claim 13; wherein there is provided a clamp which applies a pressure so as to sandwich the overlapped portion.

42. (New) An apparatus for bonding metal plates according to Claim 14; wherein there is provided a clamp which applies a pressure so as to sandwich the overlapped portion.

43. (New) An apparatus for bonding metal plates according to Claim 15; wherein there is provided a clamp which applies a pressure so as to sandwich the overlapped portion.

44. (New) A hot strip mill according to Claim 18; wherein the shearing blade drive mechanism is so constructed as to perform a cyclic operation by causing the upper and lower shearing blades to stand by at a specified stand-by position, starting pressing the shearing blades when the overlapped portion

of the two bars has reached the bonding mechanism, and then returning the shearing blade back to the stand-by position when the shearing blades have completed a pressing stroke up to the completion of bonding; and a synchronous operation by moving the shearing blades so as to follow the bar movement while the shearing blades are in contact with the bars.

45. (New) A hot strip mill according to Claim 18; wherein the overlapping mechanism is so constructed as to increase the following bar speed and overlap the two bars when the trailing end of the preceding bar has reached a specified position, and return the bar speed to an original one when the overlapped portion has reached a specified length.

46. (New) A hot strip mill according to Claim 19; wherein the overlapping mechanism is so constructed as to increase the following bar speed and overlap the two bars when the trailing end of the preceding bar has reached a specified position, and return the bar speed to an original one when the overlapped portion has reached a specified length.

REMARKS

The above amendments are respectfully submitted in order to avoid multiple dependent claim form and contain no new matter.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #381NT/49487).

Respectfully submitted,

December 14, 2000

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ABSTRACT OF THE DISCLOSURE

An upper shearing blade equipped with a protrusion of a triangle-columnar shape and a lower shearing blade equipped with a protrusion of the same shape are applied onto the overlapped portion of metal plates to be bonded, and then pressed into the metal plates in an oblique direction inclined with respect to the thickness direction by a stroke in such a range that the metal plates are not completely cut off. The operating loci of the upper, shearing blade and the lower shearing blade are overlapped each other so that one falls inside the other, and the sheared surfaces of the metal plates are formed into a bonded portion by plastic flow deformation. Therein, since a compressive force is applied onto the portions to be bonded, the portion being defined by the amount of overlap, and the portions are compressed to form a compressed portion after completion of bonding, the bonding strength enhances. Besides, since the protrusions on the shearing blades generate a pressing force pressing the sheared surfaces onto each other, by an effect of their inclined surfaces, a compression force applied onto the bonded portion further increases.